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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 20

Application Number: 09/447,030
Filing Date: November 22, 1999
Appellant(s): FORBERT ET AL.

Peter D. McDermott
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 14, 2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that each of the claims, 13-24, do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

2,384,946	Marisic	09-1945
3,939,199	Fernholz et al	02-1976
4,131,542	Bergna et al	12-1978
5,656,195	Mielke et al	08-1997

Grant and Hackh's Chemical Dictionary, Fifth edition (1987), page 258.

Perry et al, "Chemical Engineers' Handbook", Fifth edition, (1973), pp. 20-58 to 20-63.

The American Heritage Dictionary, Second College Edition, page 920 (1982).

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 13-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(In the final rejection, it is stated that claims "14-24" are rejected under 35 U.S.C. 112, second paragraph, however, in the body of the rejection, claim 13 was mentioned. This clearly indicates that "14-24" was a typographical error, the rejection should be for claims "13-24").

In claim 13, it is unclear what is required by "perceptibly". As defined by the American Heritage Dictionary, Second College Edition, "perceptibly" is "capable of being perceived", thus, it is unclear if the limitation of "perceptibly dissolves in the lyosol" requires that the vapor atmosphere has to dissolve in the lyosol or only appears to dissolve in the lyosol (but actually not dissolve).

If the phrase "does not perceptibly dissolve" has relative meaning, just as "soluble" (i.e. slightly soluble, very soluble, etc.), such phrase would render the claim indefinite. The phrase "does not perceptibly dissolve" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. On page 4, second full paragraph, it is stated that air does not dissolve in the hydrosol, however, the instant specification, including the Example 1, does not clearly define what is meant by "perceptibly dissolve in the hydrosol". In fact, the word "perceptibly" was not used in the instant specification.

Claims 13-14, 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Bergna et al (4,131,542) with the Grant and Hackh's Chemical Dictionary and Chemical Engineer's Handbook to show inherent state of fact.

Bergna '542 discloses a process for making amorphous spheroidal silica grains which comprises the steps of:

(a) spray drying with flowing air at a temperature from 130 to 400°C a silica sol;

(b) sintering the porous micrograins to reduce the surface area thereof from 5% to 20% (note claim 1).

Bergna '542 further discloses that the feed in most cases is a silica aquasol (note column 5, lines 46-47).

Bergna '542 discloses that fast heating of the droplets produces a dry skin of silica trapping water inside the hollow spheres (note column 8, lines 8-10). This silica is considered as a hydrogel because such product (note also the structure of product of Bergna '542 in Figure 1) meets the definition of a gel, note that in Grant and Hackh's Chemical Dictionary, "gel" is defined as "colloidal solution of a liquid in a solid", i.e. the solid is a continuous phase and the solid is a discontinuous phase.

Bergna '542 also discloses that the manner in which spray contacts the drying air is an important factor in spray dryer design, as this has great bearing on dried product properties by influencing droplet behavior during drying. The spray can be directed into the hot air entering from the top of the drying chamber. Product and air pass through the drying in "co-current" flow, so called after the inlet-outlet layout for air, feed, and dried product (note column 7, lines 56-60). Alternatively, the spray can be contacted with air in "counter-current" flow. Spray and air enter at the opposite ends of the dryer. This arrangement offers dryer performance with excellent heat utilization (note column 8, lines 3-6). When spray and air are contacted in counter current flow, either the spray or the air must be flowing against gravity. Thus, the claimed "moving medium flows substantially against the direction of the force of gravity" can be "at once envisaged" from the disclosure of Bergna '542. When the flow of air is fed from the bottom of the

dryer, it goes against the direction of gravity and naturally its speed would diminish in the direction of flow.

From the Chemical Engineers' Handbook, for "countercurrent" spray dryer, only one set up is shown, in which hot air is introduced from the bottom and feed is sprayed from the top (note Figure 20-71(a)).

The process of Bergna '542 anticipates the claimed process.

Claims 13-14, 16-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergna '542, with Grant and Hackh's Chemical Dictionary and optionally in view of Chemical Engineers' Handbook.

Bergna '542 discloses a process as stated above.

Chemical Engineers' Handbook can be applied to teach for countercurrent spray dryer, the hot air is conventionally introduced from the bottom.

The difference is Bergna '542 does not disclose how the lyosol is formed.

However, the method for making the starting material is given little weight absence a showing of criticality, as the starting material made by any process would be expected to perform the same function in the process. Moreover, the examiner takes Official Notice that it is known in the art to form silica sol by reacting sodium silicate with a mineral acid and using the product of one process as starting material for another process would have been within the skill of the skilled artisan, In re Kamlet 88 USPQ 106.

Claims 13-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marisic (2,384,946) in view of Fernholz et al (3,939,199) and optionally further in view of Mielke et al (5,656,195).

Marisic '946 discloses a process of producing hydrogel pellets by continuously contacting within an enclosed mixing chamber such as an injector or nozzle mixer, streams of reactant solutions of such concentration and proportions that no gelation occurs within the mixer, but only at some predetermined time after leaving the mixer, and under such conditions of flow that each stream is completely and uniformly dispersed within and throughout the other at the instant of contact. The resultant colloidal solution is ejected from the mixer through an orifice or orifices of suitable size so as to form globules of the solution which are introduced into a fluid medium where the globules of the colloidal solution set to a gel before they pass out of the medium (note page 2, lines 48-64). Pellets may also be formed by a process analogous to spray drying wherein the gelable solution is sprayed into a drying tower (note page 2, left column, lines 68-72). The fluid medium can be constituted of a gas such as air (note sentence bridging the 2 columns on page 2).

Marisic '946 further disclose that the medium may contain components, which can be dissolved therefrom by the hydrosol (note page 1, left column, lines 17-18).

Marisic '946 discloses that the hydrogel can be produced from a solution of sodium silicate and hydrochloric acid (note Example III).

It would have been obvious to one skilled in the art to select any embodiment among the specifically disclosed embodiments, Merck & Co. Inc. v. Biocraft Laboratory Inc. 10 USPQ 1846.

Marisic '946 further discloses that the fluid medium is maintained at a temperature below the boiling point of said sol. After setting is complete, the hydrogen may be washed, base exchanged, heat treated or otherwise processed to obtain the desired physical and chemical characteristics in the final product (note page 2, right

column, lines 14-40). The resulting gel possesses open pores free of liquid, this product is considered the same as the claimed aerogel.

Marisic does not specifically disclose the temperature of the process, however, it would have been obvious to optimize these process conditions to obtain the best results. It would also have been obvious to dry the hydrogel to obtain aerogel since aerogel is desired in the art.

For the step of converting the hydrogel to aerogel, in the event that the above heat treating step of Marisic '946 is not sufficient to convert the hydrogel to aerogel, Mielke '195 can be applied as stated below.

Mielke '195 teaches that silica aerogel particles are desired to be used in moldings (note claim 1). Mielke '195 further discloses that silica aerogel can be produced by solvent exchange, and subsequent supercritical drying a silica hydrogel.

Thus, it would have been obvious to one of ordinary skill in the art to convert the hydrogel of Marisic to aerogel because aerogel is desired to be used in moldings as suggested by Mielke '195.

The difference is Marisic 946 does not disclose that the fluid is moving substantially against the direction of gravity.

Fernholz '199 discloses that for a spray-drying process for converting a sol to a gel, in order to avoid damage of the gelled and still soft particles, they can be sprayed in upward inclined direction and collected in a liquid bath (for example water) or they can be conducted in countercurrent flow with a current of air or gas which reduces their impact velocity and simultaneously improves their resistance by drying. In this manner particles of almost any desired size can be produced (note column 2, lines 23-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use a current or air or gas in countercurrent flow with the spray

of silica sol in the process of Marisic '946, as suggested by Fernholz '199 because such countercurrent flow of air would reduce the silica gels impact velocity and improve their resistance by drying.

For claim 20, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have used both the water bath and the countercurrent flow of air to avoid damage of the gelled and still soft particles, because combining two or more ways as disclosed in Fernholz '199 for the same purpose has been held to be a prima facie case of obviousness, see In re Kerkhoven, 205 USPQ 1069.

(11) Response to Argument

* Issue 1:

Appellants urge that the phrase "does not perceptibly dissolve in the lyosol" is well recognized by those skilled in the art.

Appellants, however, have not provided any evidence to support the above argument that such phrase is well recognized by those skilled in the art of forming lyogels. As disclosed in the prior art portion of Appellants' specification, air is disclosed as a medium which does not noticeably dissolve in the hydrosol, however, there is no disclosure as to what medium is considered as "does not *perceptibly* dissolve in the lyosol", especially when "perceptibly" appears to have a relative meaning.

Appellants argue that the word "perceptibly" is the adverb of perceptible, which is defined as capable of being perceived.

Appellants, however, do not provide any guideline in the specification as to how or to what degree the medium can be "perceived" as not being dissolved in the lyosol,

i.e., "perceived" by a naked eye, by a microscope, or when the medium would be "perceived" as being dissolved in the lyosol? When more than 5%, 10%, 50% or 75% of the medium is actually dissolved in the lyosol?

Appellants argue that the word "perceptibly" is a well-recognized word in the chemical art and is widely used in US patents.

The word "perceptibly" may not be indefinite, per se, however, there must be sufficient disclosure in the specification so that one skilled in the art can determine the meet and bound of such word. For example, in Singer 4,420,441, (as mentioned by Appellants in the response filed February 11, 2002), the terms "perceptible dissolution" and "perceptibly dissolved" are exemplified as "sharp edged chilled iron particles may be dispersed in a aluminum matrix, not only with their sharpness preserved, but also such that analysis of the matrix near the particles will fail to detect any significant quantity of intermetallic Al/Fe compound" (note column 1, lines 15-21), i.e., by looking the sharpness of the chilled iron particles and the composition of the matrix near the particles, one skilled in the art would be able to determine whether the particles were "perceptibly dissolved". However, in Applicants' specification, there is no explanation or example for "perceptible dissolves", as a matter of fact, the term "perceptibly" was not used in Applicants' specification. Thus, it is unclear how one skilled in the art can determine which medium would "perceptible dissolve" and which would not.

* Issue 2:

Applicants argue that Bergna et al. expressly teaches avoidance of gelling.

It is true that Bergna teaches avoidance of gelling, but this is before the spray drying step, not after the spraying step. Before the spraying drying step, if gel is formed, the viscosity is too high, the spraying drying step cannot be performed. However, such teaching of Bergna does not in any way indicating or implying that a gel product cannot be formed after the spray drying step. It should also be noted that in Applicants' process, the lyosol is sprayed into the moving air (note Applicants' claim 17), just as in the process of Bergna. In general, in order to spray the lyosol, its viscosity should be kept low otherwise it will set into a big mass of gel and cannot be sprayed. Thus, the teaching of spraying drying before gelling for the process of Bergna does not in any way teaches that the product obtained after the spray drying cannot be a gel.

Appellants argue that Bergna does not suggest that spray drying be used to achieve formation of a gel and Bergna takes "dried sol" from the spray-drying medium.

The product in Bergna '542 is silica with trapping water in a hollow sphere (note column 8, lines 8-11 and Figure 1). This product would meet the definition of a gel.

Appellants argue that Bergna fails to disclose formation of a gel by introducing a lyosol into a moving medium which flows substantially against the direction of gravity and which does not perceptibly dissolve in the lyosol.

As stated in the above rejection, Bergna '542 discloses a method of spray drying (i.e., introducing) a sol (note claim 1). In the process, the spray and air are contacted in "counter-current" flow and they enter at the opposite ends of the dryer (note column 8, lines 3-8). This fairly discloses, with sufficient specificity, the claimed moving medium, which flows substantially against the direction of gravity (because there only two choices for the air flow direction, either in the direction of gravity or against the direction of gravity). The air used in Bergna '542 would inherently be as "not perceptibly dissolve in the lyosol" as the air used in Appellants' claimed process. Thus, Bergna '542 has all

the positive process limitations as required by Appellants' claims. Appellants have not specifically pointed out any deficiencies in the above rejection.

Appellants argue that Bergna never discloses, teaches or suggests forming a gel, but is instead directed to drying aquasol or organosol in porous micrograins referred to as "PMG".

Regardless of what name is given to the product of Bergna, such product still meet the definition of a gel, note Grant and Hackh's Chemical Dictionary. The product of Bergna also meet the definition of a gel as mentioned in Appellants' specification, page 5, second full paragraph from the bottom, i.e., " the term lyosol or lyogel understood to mean a sol or a gel in which the sol or gel interstices are filled with fluid. If the fluid consists essentially of water, then one speaks of a hydrosol or hydrogel, as the case may be." Moreover, since the process of Bergna '542 has all the positive process steps as the claimed process, the process of Bergna '542 would inherently produce the same product as the claimed process.

Appellants argue that the process of Bergna "involves spray-drying an aqueous sol in a manner similar to that disclosed in U.S. Pat. 3,301,635" and U.S. Pat. '635 describes formation of amorphous silica bodies and not formation of gel.

The above argument is not persuasive because U.S. Patent '635 is not relied upon for any of the rejections.

Appellants state that in column 8, lines 8-11 of Bergna, a process of freeze-drying is discussed and in column 7, lines 70-72, freeze drying is also mentioned.

As clearly stated in the above rejection, the Bergna 4,131,542 is relied upon to reject the claims. In column 8, lines 8-11, Bergna discloses that "[F]ast heating of the droplets produces a dry skin of silica trapping water inside the hollow spheres. Evaporation and evolution of the trapped water tends to produce a hole through the

spherical grains obtained as a product." There is no mention of "freeze drying" as argued by Appellants. Also, column 7 of Bergna '542 does not have lines 70-72.

Appellants argue that Grant and Hackh's Chemical Dictionary and Chemical Engineer's Handbook cannot cure the deficiencies of Bergna discussed above.

Bergna '542 is applied as stated in the above rejection. The process of Bergna '542 anticipates the claimed process. The two secondary references are relied upon only to show inherent state of fact, not to cure any deficiencies of Bergna.

For claim 14, Bergna clearly discloses that the spray is contacted with air.

For claim 16, Bergna clearly discloses that the sol is sprayed (this is considered the same as "dropwise") and spray and air are contacted in counter-current flow (this is considered the same as "moving air").

For claim 17, Appellants' argument is not persuasive for the same reason as stated for claim 16.

For claim 18, as stated in the above rejection, when spray and air enter at the opposite ends of the dryer, there can only be two possibilities, either air enters at the top or at the bottom. This disclosure fairly teaches, with sufficient specificity, that air can enter from the bottom of the dryer. In this case, the air flow is against the force of gravity.

For claim 19, when the air flow is against the force of gravity, the velocity of the flow would inherently diminish in the direction of the flow.

* Issue 3:

For claims 13-14, 16-19, the rejection is maintained for the same reasons as stated in the above rejection and answers to Appellants' arguments.

For claim 20, in Bergna '542, the sol can be an aquasol (note for example, column 2, lines 53-58). Thus, the silica sol is surrounded by water, this would meet the claimed "lyosol particles are trapped in a layer of water".

For claim 21, note the above rejection, the method for making the starting material is given little weight absence a showing of criticality or unexpected results, as the starting material made by any process would be expected to perform the same function in the process. Moreover, Appellants have not challenged the Examiner's Official Notice that it is well known in the art that silica sol can be formed by reacting sodium silicate with a mineral acid.

For claim 22, this claim is unpatentable for the same reasons as stated above for claim 21.

* Issue 4:

Applicants argue that there is no teaching or suggestion in Marisic that a lyosol be introduced into a moving medium which does not perceptibly dissolve in the lyosol.

Granted that in Marisic, it is disclosed that "it is essential... that the sol be not mechanically disturbed during the time of setting", however, "not mechanically disturbed" does not imply that the fluid medium, into which the sol is injected, is not moving. In Marisic, the fluid medium can be either a liquid or a gas such as air (note paragraph bridging the two columns of page 2). Marisic discloses that "pellets may also be formed by a process analogous to spray drying wherein the gelable solution is sprayed into a drying tower..." Marisic also discloses that even when a liquid is used as the fluid medium, air is injected into the solution to form at least some movements in the solution. Thus, the phrase "not mechanically disturbed" does not exclude the movement of the fluid medium (gas or liquid), i.e., the contact between the fluid medium

(which can be gaseous) and the globules of the solution is *not* considered as a mechanical disturbance. Such phrase probably excludes the use of physical means, such as agitator, baffle, to cause the breaking up or milling of the gels.

Appellants argue that Fernholz is directed to oxacylation of olefins in the gaseous phase. There is no teaching or suggestion in Fernholz to mix gel-forming components to produce lyosol.

Fernholz is applied to teach that in order damage to the gelled and still soft particles, they can be sprayed in upward inclined direction and collected in a liquid bath or they can be conducted in countercurrent flow with a current of air or gas reduced their impact velocity and simultaneously improves their resistance by drying (note column 2, lines 25-31). Fernholz is not relied upon to teach the step for producing lyosol.

Appellants further argue that there is no motivation Marisic and Fernholz because they are non-analogous art.

"In order to reply on a reference as a basis for rejection of an applicant's invention, the reference must be either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the invention was concerned." In re Oetiker, 977 F. 2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See MPEP 2141.01(a). In this case, Marisic '946 concerns about a structurally strong pellet by not mechanically disturbed the sol during the time of setting (note page 2, right column, lines 1-13) and Fernholz '199 also concerns about avoiding damage of the gelled and still soft particles when they being sprayed dried by conducting the spray drying method in countercurrent flow (note column 2, lines 25-33).

For claim 14, Marisic clearly discloses that the fluid medium can be a gas such as air (note sentence bridging the two columns of page 2).

For claim 15, Marisic discloses that the medium may contain components, which can be dissolved therefrom by the hydrosol (note page 1, left column, lines 17-25).

For claim 16, Marisic discloses that pellets may be formed by a process analogous to spray drying process and the fluid medium can be air (note page 2, left column, line 69 to right column, line 5).

For claim 17, this claim is unpatentable for the same reason as stated above for claim 16.

For claim 18, Marisic does not teach the direction for the air, however, as stated in the above rejection, Fernholz is applied to teach that counter-current flow would avoid damage of the gelled particles.

For claim 19, when counter-current flow is used, It would have been obvious to one of ordinary skill in the art at the time of the invention was made introduce the air in the direction against gravity to reduce the impact velocity as desired by Marisic.

For claim 20, when the air is flowing against gravity, the velocity would inherently diminish in the direction of flow.

For claims 21-22, Marisic discloses that hydrogel can be produced from a solution of sodium silicate and hydrochloric acid (note Example III). Also, see the reasons as stated for claims 21-22 in Issue 3 above.

For claim 23, Marisic discloses that the gel can be dried to remove water and the resulting gel possesses open pores free of liquid. The resulting gel is considered the same as the claimed aerogels (gel which is filled with air). In any event, Mielke '195 can be applied to teach that the silica aerogel is desired in the art and it can be produced from a silica hydrogel.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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